No. 822,096. PATENTED MAY 29, 1906.

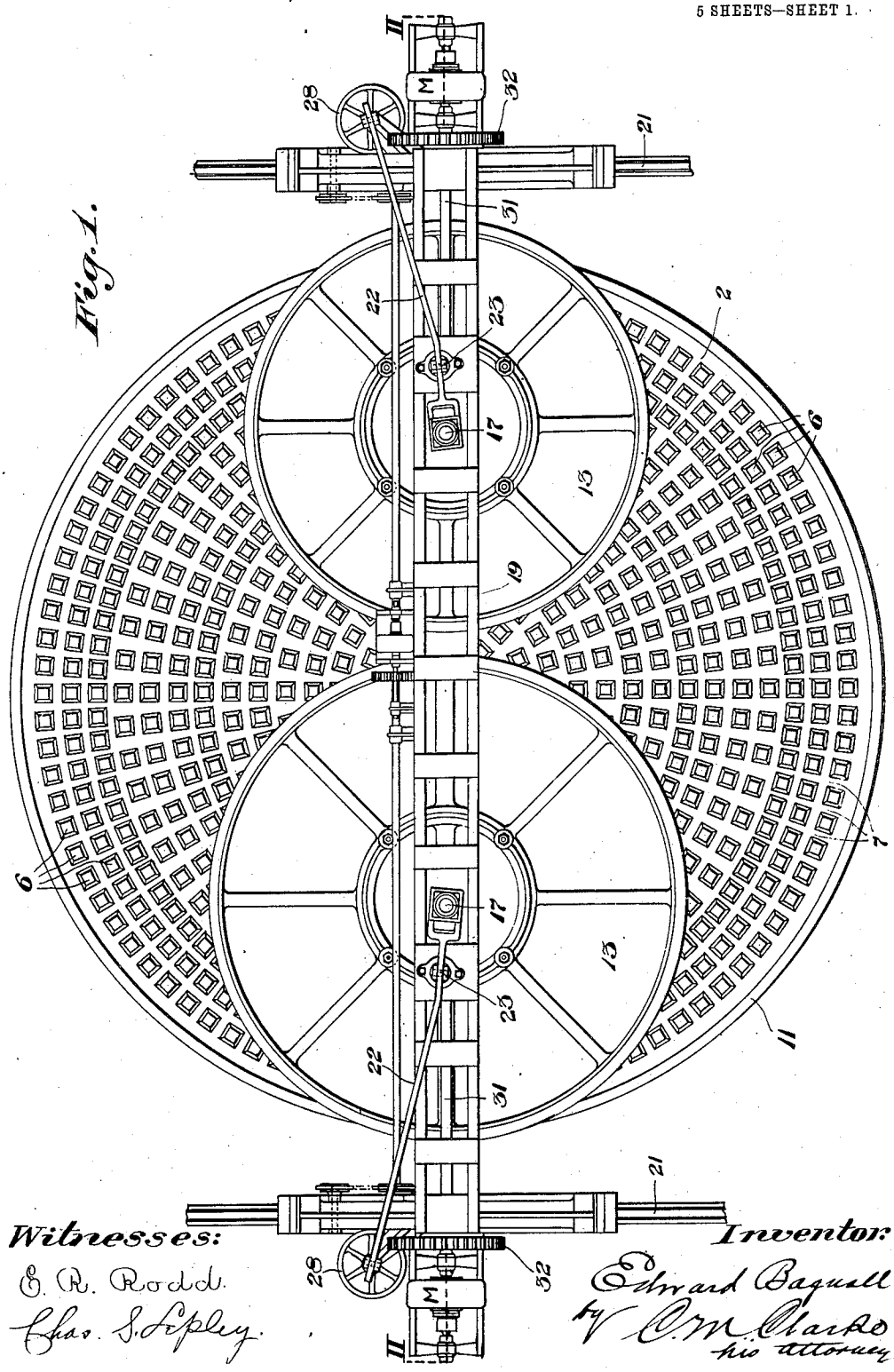
E. BAGNALL.

APPARATUS FOR GRINDING, SMOOTHING, AND POLISHING PLATE GLASS.

APPLICATION FILED JUNE 24, 1905.

5 SHEETS—SHEET 1.

Fig. 1.



Witnesses:
E. R. Rodd.
Chas. S. Lipley.

Inventor:
Edward Bagnall
by O. M. Clarke
his attorney.

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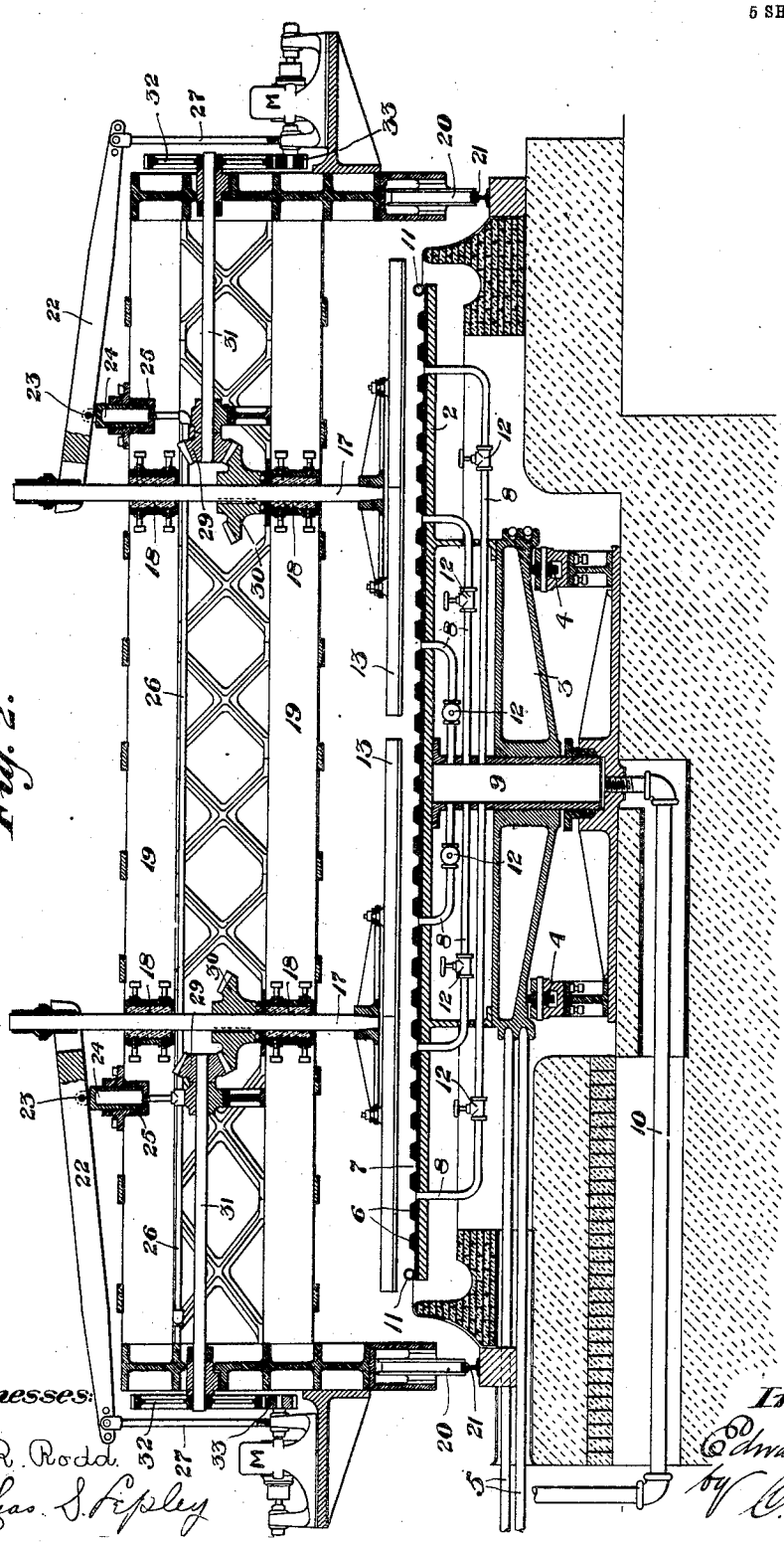
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5 SHEETS—SHEET 2.

Fig. 2.



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5 SHEETS—SHEET 3.

Fig. 3.

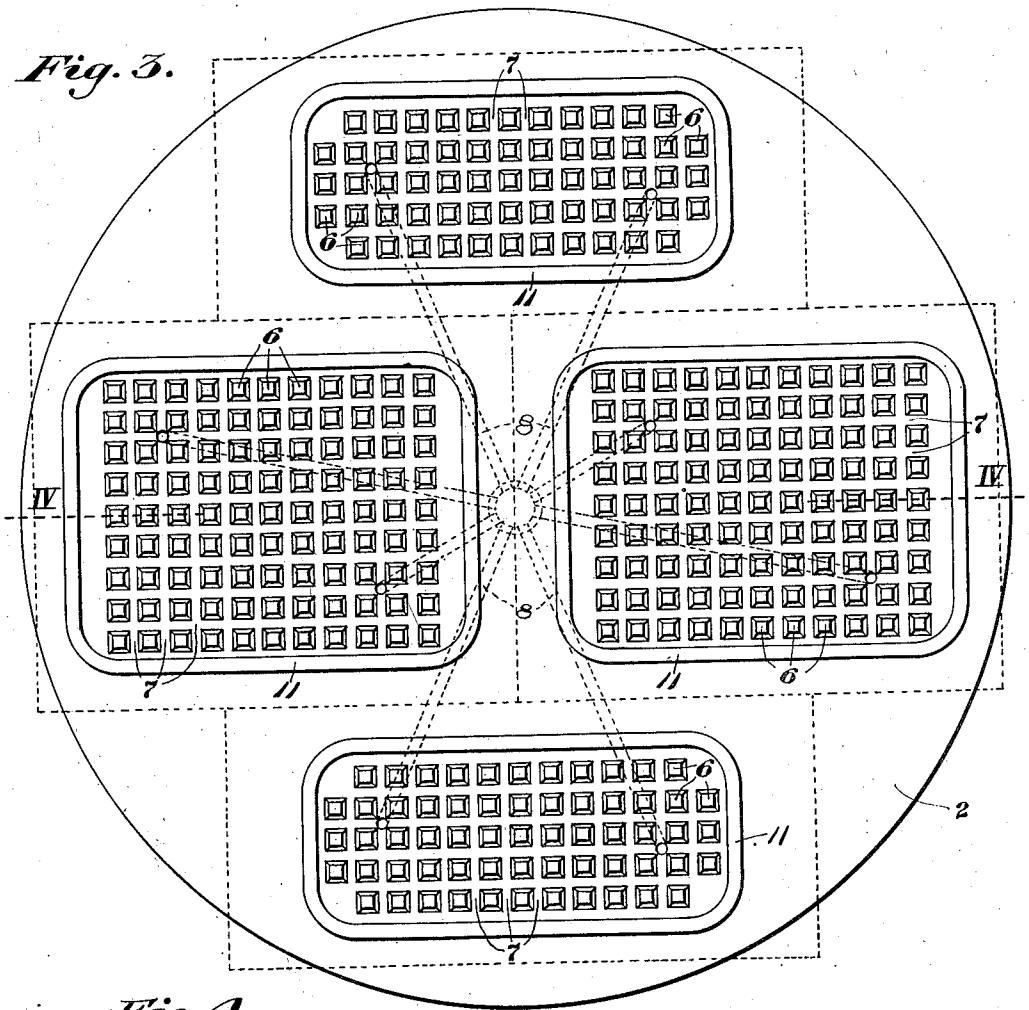
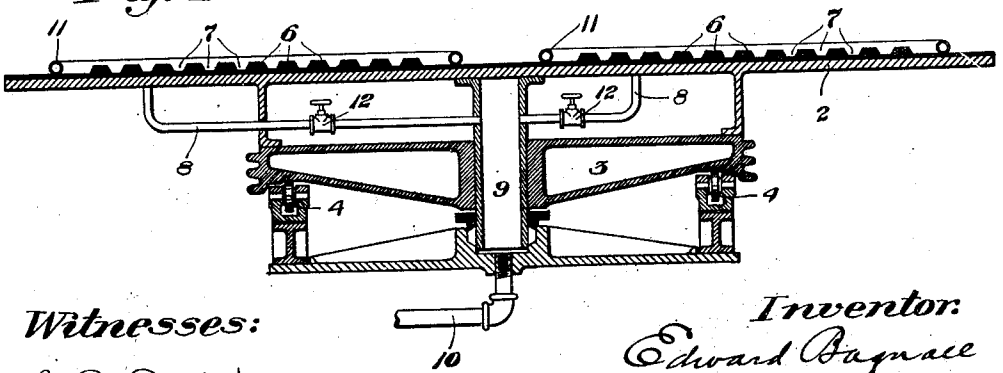


Fig. 4.



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5 SHEETS—SHEET 4.

Fig. 5.

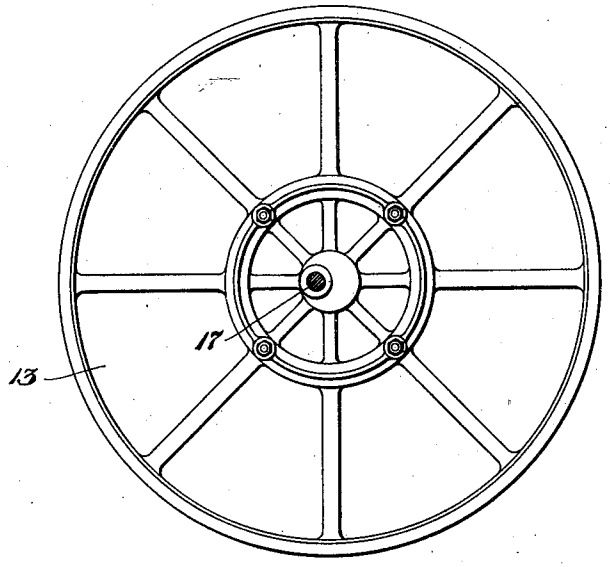


Fig. 6.

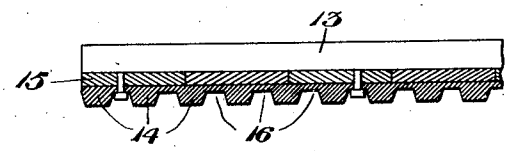


Fig. 7.

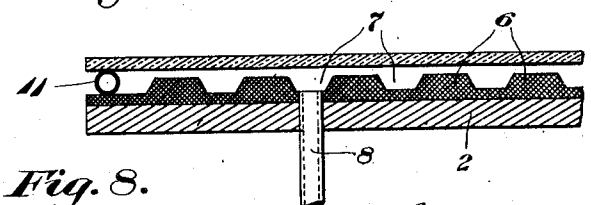
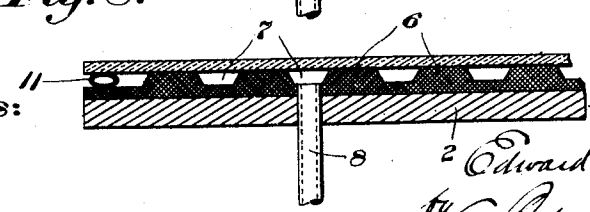


Fig. 8.



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E. BAGNALL.

APPARATUS FOR GRINDING, SMOOTHING, AND POLISHING PLATE GLASS.

APPLICATION FILED JUNE 24, 1905.

5 SHEETS—SHEET 5.

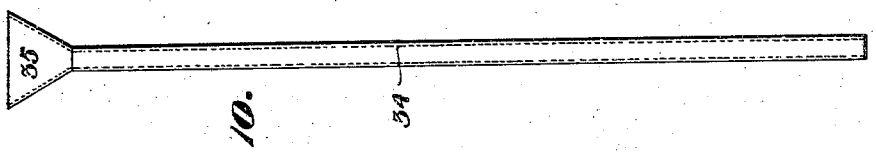


Fig. 10.

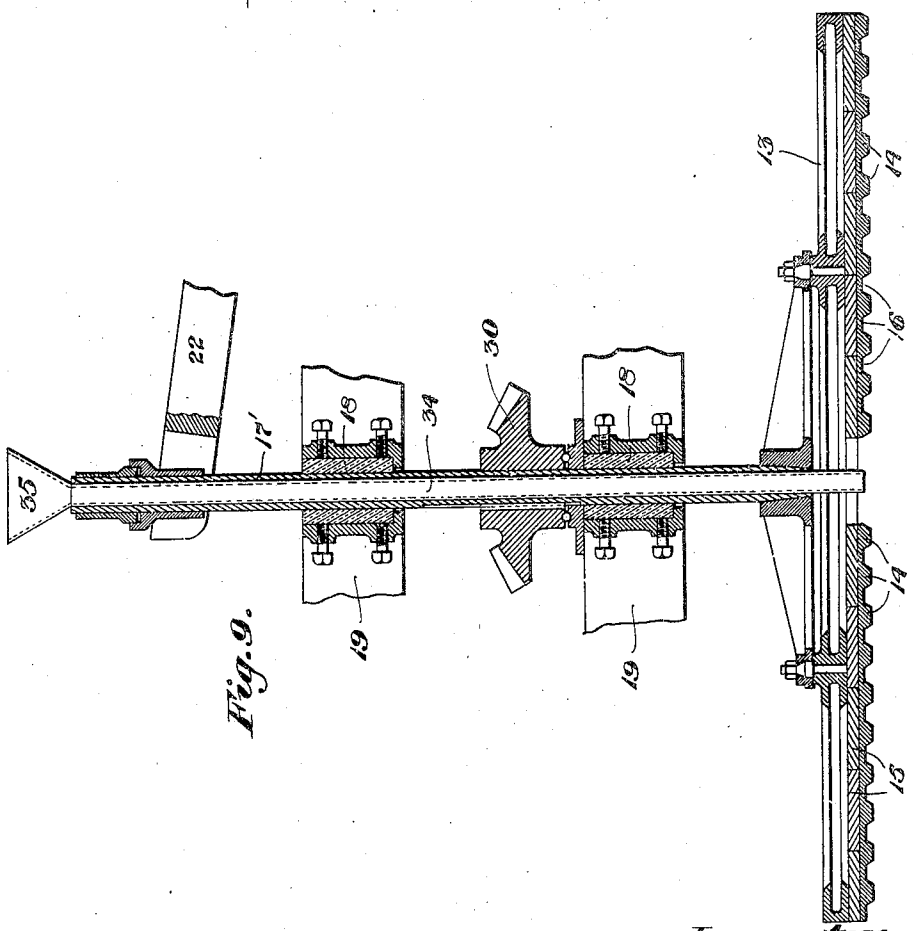


Fig. 9.

Witnesses:

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Chas. S. Lepley

Inventor:

Edward Bagnall

by V. O. M. Clarke

his Attorney

UNITED STATES PATENT OFFICE.

EDWARD BAGNALL, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR TO ZOFFER PLATE GLASS MANUFACTURING COMPANY, OF PITTSBURG, PENNSYLVANIA, A CORPORATION OF WEST VIRGINIA.

APPARATUS FOR GRINDING, SMOOTHING, AND POLISHING PLATE-GLASS.

No. 822,096. Specification of Letters Patent. atented May 29, 1906.

Application filed June 24, 1905. Serial No. 266,809.

To all whom it may concern:

Be it known that I, EDWARD BAGNALL, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Apparatus for Grinding, Smoothing, and Polishing Plate-Glass, of which the following is a specification, reference being had therein to the accompanying drawings, forming part of the specification, in which—

Figure 1 is a plan view of my improved apparatus for grinding, smoothing, and polishing plate-glass. Fig. 2 is a central longitudinal vertical section therethrough indicated by the line II II of Fig. 1. Fig. 3 is a plan view of the rotating table, showing a modified construction and arrangement adapted to support a plurality of plates independently. Fig. 4 is a vertical sectional view on the line IV IV of Fig. 3. Fig. 5 is a plan view of one of the eccentrically-mounted rotating runners. Fig. 6 is an enlarged sectional detail view through a portion of the runner, illustrating the manner of attaching the grinding elements. Fig. 7 is a similar view of a portion of the table, showing the manner of supporting the plate of glass before exhausting the air. Fig. 8 is a similar view, the air having been exhausted and showing the plate resting solidly upon the supporting-abutments. Fig. 9 is a vertical sectional detail view of one of the runners and its connected parts, illustrating a hollow spindle provided with my improved removable supply-pipe. Fig. 10 is a detail view in elevation of one of said removable pipes.

My invention relates to improvements in apparatus for grinding, smoothing, and polishing plate-glass, and has for its object to provide improved means for supporting the plates of glass both before and after exhausting the air from underneath the plate to provide a resulting holding pressure of the atmosphere, also to means for effectively exhausting the air from one or from a plurality of separately-supported plates, means for supplying abrasive material to the runners, together with various other features of improvement and construction, as shall be more fully hereinafter set forth.

Referring now to the drawings, 2 represents the rotating table, upon which the glass plate or plates to be polished are supported, the table consisting of a platform of cast-iron or other suitable material mounted upon a turn-table base 3, so arranged as to be rotatably supported upon any suitable mechanism, as a series of concentrically-arranged casters or rollers 4, the turn-table and entire platform being rotated in any suitable manner, as by cables 5, passing around suitable grooves in the turn-table periphery.

The upper surface of the table is provided with a series of bearing-abutments 6, of rubber or other suitable cushioning material of sufficient strength to uphold the glass plates under the grinding operation, but sufficiently resilient to give slightly under said pressure and to thereby permit the plates to become firmly seated thereon. The abutments 6 project upwardly beyond the main lower portion of such upper covering, which may conveniently be made in one or a series of molded sheets entirely covering the area of the table and so constructed that when surrounded by a suitable packing the intervening spaces 7 between the abutments communicate throughout in various directions and constitute a chamber from which the air may be exhausted by withdrawing it from any one or more points. For the purpose of effecting such withdrawal of the air or creating a partial vacuum I provide a series of pipes 8, extending up through the bottom portion of the table, as shown in Fig. 2, and connected with a central shell 9, forming an integral rotating portion of the platform and turn-table. From the central chamber within said tube 9 the air is exhausted by means of a pipe 10, leading from the base to any suitable exhausting mechanism, as a pump. By this construction it will be seen that communication is established between the pump and all of the various connections leading to the interstitial passages 7 either during rotation or the stationary status of the table.

For the purpose of packing around the entire outer edge of the platform 2 or around segregated areas thereof, as in Fig. 3, and hermetically inclosing all or any desired portion of the cushion-abutments 6 I provide a

pneumatic tube 11 of sufficient stiffness to uphold the weight of the glass plate, but of sufficient flexibility to compress thereunder, due to the pressure of the outer atmosphere, when the air has been exhausted from underneath the plate, the operation being clearly illustrated in Figs. 7 and 8.

The plates having been placed upon the platform and the air exhausted from underneath them, they will compress the resilient pneumatic tubes 11 and will also rest downwardly upon the abutments 6, which will thus provide a continuous series of closely-adjacent supports in all directions. This construction is of advantage in providing a good bearing for the glass plates throughout, entirely overcoming any tendency to warping or bending, while the resiliency of the tubes 11 is sufficient to again raise the plates from contact with the abutments after the air has again been supplied underneath. For this latter purpose any suitable means may be employed, as valves 12, by which air may be admitted independently underneath any of the various plates where several are ground. A particular advantage of such construction is that one or more of the plate-receiving areas may be cut out from the suction system without interfering with the other areas or the operation of the vacuum-producing plant.

The polishing and grinding operation is performed by runners 13, circular in form, preferably two in number, and of varying diameters, so arranged above the rotating platform 2 that they will operate over different areas thereof, for which purpose one of the runners is larger in diameter than the other and overlaps beyond the center of the platform, as shown at the left of Fig. 2. These runners are of any suitable construction adapted to provide a solid circular disk-like head, to the under portion of which are secured the grinding and polishing irons 14, which are secured up against the under side of the runners by means of bolts upon an intervening sheathing 15 of wood, which is also held by bolts or otherwise to the under side of the runners. The irons 14 are provided with a series of intervening channels 16, by which the abrasive material is free to circulate in various directions outwardly from the center of the runner, for which purpose I have provided an improved abrasive-delivery mechanism, which shall be hereinafter described. If desired, however, the abrasive material may be delivered upon the glass plates in any suitable manner.

For the purpose of securing the best results the runners are eccentrically mounted upon the lower ends of driving-spindles 17, mounted in suitable bearings 18 18 in an upper carriage structure 19, mounted upon wheels 20, whereby the entire supporting-framework for the runners may be run along upon rails 21 21 at each side of the platform and over to or from the working position. The spindles 17 are vertically movable by means of lever mechanism 22, provided with suitable raising and adjusting devices, which will be readily understood without detailed description and are similar to mechanism for the same purpose well known in the art. For the purpose of quickly raising the levers 22 and runners 13 away from contact or of quickly lowering them upon the glass plates the levers are pivoted at 23 to the upper ends of plungers 24, mounted in cylinders 25 on the upper portion of the framework 19 and connected by pipes 26 to any suitable source of pressure, as by flexible hose. By this construction it will be seen that a very quick raising or lowering adjustment of the runners may be secured.

For the purpose of accurately and delicately adjusting the runners the outer ends of levers 22 are provided with the usual temper-screws 27, passing downwardly through suitable bearings and provided with hand-wheels 28, mounted upon their threaded extremities.

The spindles 17 and the runners are rotated through bevel-gearing 29 30, the latter bevels being in spline engagement with the spindles, bevels 29 being mounted on shafts 31, driven through gearing 32 33 by electric or other motors M, mounted on the traveling framework, as clearly shown in Figs. 1 and 2. By this construction it will be seen that the runners may be delicately adjusted to the work, quickly raised and lowered therefrom when desired, and rotated by mechanism mounted entirely upon the carriage.

For the purpose of conveniently delivering the abrasive material to the central portion of the runners the spindles 17', Fig. 9, are made hollow, so as to receive the inner tube 34, provided with an upper funnel 35 and extending downwardly to a point immediately above the lower faces of the ironing-blocks 14, as clearly shown. The construction otherwise is the same as that just described, and a particular advantage of this arrangement is that I am thereby enabled to supply abrasive material of different qualities or of different constituent material, as sand and emery, to the glass plates without danger of mixing them. The advantage of this construction will be readily appreciated, for the reason that in the operation of grinding rough plates with sand more or less of the sand is necessarily left in the feeding-tube, whereas in the operation of polishing such remaining particles of sand becoming mixed with the emery are liable to scratch the polishing-surface of the glass and to destroy or greatly interfere with its successful polishing. By my construction I absolutely terminate

the abrasive operation of the sand by the removal of the sand-tube and then insert the emery-tube, so that each is separate from the other, and any liability of the harmful effects above noted is completely avoided.

The operation of the apparatus will be readily understood from the foregoing description. It is capable of grinding and polishing plates of various sizes and of safely supporting them throughout their entire under surface during the polishing operation, thus preventing danger of breakage or warpage.

The invention is comparatively inexpensive to maintain in operative condition, greatly cheapens and simplifies the finishing of the plates, and is well adapted to the objects in view.

Changes and variations may be made by the skilled mechanic in the design, proportions, or various details of construction, as I do not desire to be limited to the exact construction shown and described; but all such changes are to be considered as within the scope of the following claims.

What I claim is—

1. In apparatus for smoothing plate-glass, the combination of a rotating table, an integral covering therefor of impervious resilient material as rubber having a plurality of upwardly-extending supporting projections and a connected series of intervening air-circulation spaces, an independent surrounding cushioning device, means for exhausting the air from the cushioning spaces whereby a superimposed plate is caused to compress the bearing projections to make an air-tight engagement, means for rotating the supporting-table in one direction, and superimposed runners, with means for rotating them in the opposite direction, substantially as set forth.

2. In apparatus for smoothing plate-glass, a rotating table provided with a series of resilient supporting-abutments and intervening communicating air-circulation spaces, and a surrounding cushion, with means for exhausting the air from the circulation-spaces, substantially as set forth.

3. In apparatus for smoothing plate-glass, a rotating table provided with a series of resilient supporting-abutments and intervening communicating air-circulation spaces, and a surrounding pneumatic cushion, with means for exhausting the air from the circulation-spaces, substantially as set forth.

4. In apparatus for smoothing plate-glass, a rotating table provided with a series of resilient supporting-abutments and intervening air-circulation spaces, with means for exhausting the air therefrom, substantially as set forth.

5. In apparatus for smoothing plate-glass, a rotating table provided with a series of intergally-connected resilient supporting-abutments and intervening communicating air-circulation spaces with means for exhausting the air from said spaces, substantially as set forth.

6. In apparatus for smoothing plate-glass, a rotating table provided with a plurality of series of resilient supporting-abutments and intervening air-circulation spaces with means for exhausting the air from the spaces of each of said series independently, substantially as set forth.

7. In apparatus for smoothing plate-glass, a rotating table provided with a plurality of series of supporting-abutments extending above the surface of the table and intervening air-circulation spaces, cushioning devices surrounding each of said series of abutments, with means for exhausting the air from the spaces of each of said series independently, substantially as set forth.

8. In apparatus for smoothing plate-glass, a rotating table provided with a flat base having an upwardly-extending series of rubber supporting-abutments and intervening air-circulation spaces, a surrounding compressible cushion extending slightly above the normal level of the abutments, with means for exhausting the air from the circulation-spaces, substantially as set forth.

9. In apparatus for smoothing plate-glass, the combination of a rotating table provided with a flat base having an upwardly-extending series of resilient supporting-abutments and intervening air-circulation spaces, a surrounding cushioning device, a central hollow mast, pipes communicating with said mast and with the air-circulation spaces, and means for exhausting the air from the hollow mast, substantially as set forth.

10. In apparatus for smoothing plate-glass, the combination of a rotating table provided with a flat base having an upwardly-extending series of resilient supporting-abutments and intervening air-circulation spaces, a surrounding cushioning device, a central hollow mast, pipes communicating with said mast and with the air-circulation spaces, provided with valves, and means for exhausting the air from the hollow mast, substantially as set forth.

11. In apparatus for smoothing plate-glass, the combination of a rotating table provided with a flat base having an upwardly-extending series of resilient supporting-abutments and intervening air-circulation spaces, a surrounding cushioning device, a central hollow mast, pipes communicating with said mast and with the air-circulation spaces, means for exhausting the air from the hollow mast, and a superimposed rotating runner, substantially as set forth.

12. In apparatus for smoothing plate-glass, the combination of a rotating table provided with a flat base having an upwardly-extend-

ing series of resilient supporting-abutments and intervening air-circulation spaces, a surrounding cushioning device, a central hollow mast, pipes communicating with said mast and with the air-circulation spaces, means for exhausting the air from the hollow mast, and a plurality of superimposed runners, substantially as set forth.

13. In apparatus for smoothing plate-glass, the combination of a rotating table provided with a flat base having an upwardly-extending series of resilient supporting-abutments and intervening air-circulation spaces, a surrounding cushioning device, a central hollow mast, pipes communicating with said mast and with the air-circulation spaces, means for exhausting the air from the hollow mast, and a superimposed runner, with means for rotating the runner in a direction opposite to the rotation of the table, substantially as set forth.

14. In apparatus for smoothing plate-glass, the combination of a rotating table provided with a series of upwardly-extending resilient supporting-abutments and intervening air-circulation spaces, a surrounding cushioning device, a central hollow mast, pipes communicating with said mast and with the air-circulation spaces, means for exhausting the air from the hollow mast, and a plurality of superimposed runners, with means for rotating the runners in a direction opposite to the rotation of the table, substantially as set forth.

15. In apparatus for smoothing plate-glass, the combination of a rotating table provided with a series of upwardly-extending resilient supporting-abutments and intervening air-circulation spaces, a surrounding cushioning device, a central hollow mast, pipes communicating with said mast and with the air-circulation spaces, means for exhausting the air from the hollow mast, and a plurality of superimposed runners of different diameters, with means for rotating the runners in a direction opposite to the rotation of the table, substantially as set forth.

16. In apparatus for smoothing plate-glass, the combination of a rotating table provided with a series of upwardly-extending resilient supporting-abutments and intervening air-circulation spaces, a surrounding cushioning device, a central hollow mast, pipes communicating with said mast and with the air-circulation spaces, means for exhausting the air from the hollow mast, and a superimposed traveling carriage provided with vertically-adjustable rotating runners, substantially as set forth.

17. In apparatus for smoothing plate-glass, the combination of a rotating table provided with a series of upwardly-extending resilient supporting-abutments and intervening air-circulation spaces, a surrounding cushioning device, a central hollow mast, pipes communicating with said mast and with the air-circulation spaces, means for exhausting the air from the hollow mast, and a superimposed traveling carriage provided with vertically-adjustable rotating runners, and means mounted on the carriage for actuating the runners, substantially as set forth.

18. In apparatus for smoothing plate-glass the combination of a rotating table provided with a series of supporting-abutments and intervening air-circulation spaces, a surrounding cushioning device, a central hollow mast, pipes communicating with said mast and with the air-circulation spaces, means for exhausting the air from the hollow mast, and a superimposed traveling carriage provided with vertically-adjustable rotating runners, levers arranged to raise and lower the runners, fluid-actuated mechanism arranged to elevate the fulcrums of said levers, and screw mechanism for adjusting the levers on their fulcrums, said mechanism being mounted on the carriage, substantially as set forth.

19. The combination with the rotating table of a glass-smoothing apparatus, of a glass-supporting cushion consisting of a layer of rubber provided with upwardly-extending abutments, substantially as set forth.

20. The combination with the rotating table of a glass-smoothing apparatus, of a glass-supporting cushion consisting of a layer of rubber provided with upwardly-extending abutments, and intervening communicating air-circulation openings, substantially as set forth.

21. The combination with the rotating table of a glass-smoothing apparatus, of a glass-supporting cushion consisting of a layer of rubber provided with upwardly-extending abutments, and intervening communicating air-circulation openings, with a surrounding cushioning device extending slightly above the normal top level of the abutments, substantially as set forth.

22. The combination with the rotating table of a glass-smoothing apparatus, of a glass-supporting cushion consisting of a layer of rubber provided with upwardly-extending abutments, and intervening communicating air-circulation openings, with a surrounding inflated pneumatic tube extending slightly above the normal top level of the abutments, substantially as set forth.

23. The combination with the rotating table of a glass-smoothing apparatus, of a glass-supporting cushion consisting of a layer of rubber provided with upwardly-extending abutments, and intervening communicating air-circulation openings, with a surrounding inflated pneumatic tube extending slightly above the normal top level of the abutments, and means for exhausting the air from the

air-circulation openings, substantially as set forth.

24. In glass-smoothing apparatus, the combination with the hollow spindle of a rotating runner, of a removable tube for supplying abrasive material to the under portion of the runner, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

EDWARD BAGNALL.

Witnesses:
CHAS. S. LEPLEY,
C. M. CLARKE.